

**SUMMARY OF FIRE PROTECTION PROGRAMS
FOR THE DEPARTMENT OF ENERGY -
CALENDAR YEAR 1995**



**UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF WORKER HEALTH AND SAFETY**

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FOREWORD

This edition of the Summary of Fire Protection Programs for the Department of Energy (DOE) continues a series of annual reports started in 1972. The primary source materials for this summary are annual fire protection program summary reports submitted by site contractors to their respective DOE field organizations and subsequently forwarded to the Office of Environment, Safety and Health in accordance with Departmental and predecessor agency requirements in place since May 1950. These requirements, provided within DOE Order 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements" and its recent replacement, DOE Order 231.1, "Environment, Safety and Health Reporting," further call for a compilation and analysis of this data and the publication of this annual summary.

Beginning in 1981, all individual accident reports required by DOE Order 5484.1 have been compiled within the Computerized Accident Incident Reporting System (CAIRS). Each quarter, CAIRS issues the Occupational Injury and Property Damage Summary which statistically reports DOE loss topics such as: fatalities, injuries, illnesses, fires, and nonfire losses. The Summary of Fire Protection Programs for DOE (hereafter referred to as the Annual Summary) is compiled from field organization annual reports and includes more comprehensive data and analysis of the Department's fire protection programs and performance indicators. Fire loss statistics are provided, as are reports on a broad range of fire protection activities including: automatic fire suppression system performance, fire department responses, and the recurring costs of fire protection at DOE. Fire loss statistics from the Annual Summary are validated with the CAIRS fire loss reports. They are also compared with CAIRS nonfire loss data as an additional measure of the effectiveness of the Department's fire protection programs.

The report for calendar year (CY) 1995 was summarized from information sent to Headquarters by 22 out of 27 field organizations representing approximately 97 percent of DOE's holdings. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 20 categories represented. Abbreviations are identified in the Glossary, as are the DOE site and management and operations (M&O) contractors and major definitions.

GLOSSARY

Field organization abbreviations:

AL	Albuquerque Operations
CH	Chicago Operations
ETC	Energy Technology Centers ¹
ID	Idaho Operations
NPR	Naval Petroleum Reserves ²
NV	Nevada Operations
OK	Oakland Operations (San Francisco)
OFO	Ohio Field Office
OR	Oak Ridge Operations
PA	Power Administrations ³
PNR	Pittsburgh Naval Reactors Office
RF	Rocky Flats Operations
RL	Richland Operations
SNR	Schenectady Naval Reactors Office
SPR	Strategic Petroleum Reserves
SR	Savannah River Operations
SSC	Superconducting Super Collider Project
YM	Yucca Mountain Site Characterization Project Office

Site or M&O contractor abbreviations:

BAPL	Bettis Atomic Power Laboratory
ANL-W	Argonne National Laboratory, West
BNL	Brookhaven National Laboratory
ETEC	Energy Technology Engineering Center

¹ Energy Technology Center organizations are comprised of: the Bartlesville Project Office (BPO); the Pittsburgh Energy Technology Center (PETC); and the Morgantown Energy Technology Center (METC).

² Naval Petroleum Reserve organizations are comprised of: the Naval Petroleum Reserves in California (NPR-1), and the Naval Petroleum & Oil Shale Reserves in CO, UT, and WY (NPR-2,3).

³ Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

FA	Fermi National Accelerator Laboratory
HAN	Hanford Site
INEL	Idaho National Engineering Laboratory
K25	Oak Ridge's K-25 Site
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
LANL	Los Alamos National Laboratories
LLNL	Lawrence Livermore National Laboratories
MB	Mound Site
NTS	Nevada Test Site
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant ⁴
PPPL	Princeton Plasma Physics Laboratory
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
Y12	Oak Ridge's Y-12 Plant

The below reference is used throughout the report to identify various DOE elements:

DOE field organization (abr.)/site or M&O contractor (abr.)

Example: AL/LANL

⁴ On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC) essentially transferring all ownership responsibilities to USEC.

DEFINITIONS

The following terms are defined in the text of DOE Manual M 231.1-1, "Environment, Safety, and Health Reporting Manual." Major definitions not included in this manual have been extracted from the rescinded order DOE 5484.1 to clarify key concepts. Section references to these documents are given at the end of the definition.

1. **Property Value:** The approximate replacement value of all DOE-owned buildings and equipment. Include the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Exclude the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (APPENDIX C, DOE M 231.1)
2. **Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is done in fact. Estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage, (3) any reductions for salvage value, and (4) any lost revenue experienced as a result of the accident. Estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property is not reportable, even if DOE is liable for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and nonfire loss events. (APPENDIX C, DOE M 231.1)
3. **Fire Loss:** All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off. (APPENDIX C, DOE M 231.1)
4. **Nonfire Loss:** All damage or loss sustained as a consequence of the following events: (1) explosions; (2) natural cause events (such as earthquakes and hurricanes); (3) electrical malfunctions; (4) transportation (cargo) losses; (5) mechanical malfunctions; (6) radiation releases or other nuclear accidents; and (7) miscellaneous accidents (such as thermal, chemical or corrosion-related accidents). (CHAPTER 4.2.c, DOE 5484.1)
5. **Loss Rate:** Unit of comparison in cents loss per \$100 of property value.

EXECUTIVE SUMMARY

The DOE experienced no fatalities or major injuries caused by fire in CY 1995. In all, 87 reported fire incidents produced a loss of approximately \$743,374. This results in a fire loss rate of approximately 0.06 cents for each \$100 of controlled property value; a decrease of about 55 percent over the previous year's figure. If the DOE were to compare its fire loss rate to that of the private sector, the Department would have to incur losses of over \$3.6 million to match comparable industry losses for CY-1995.

DOE's success in reducing the incidence of fire and the risk to the public and its workers is attributed to the implementation and maintenance of a comprehensive fire protection program, comparable to and, in some cases, exceeding that of the private sector. This program includes the adoption of a "defense in depth" fire safety philosophy; conformance with industry standards and DOE-specific fire safety criteria for design, construction, and operation of its facilities; fully capable site emergency response forces; and qualified fire safety professionals.

Recurring costs for these fire protection activities approached \$110 million for the year, an increase of 5.7 percent over the previous year's figure. Note that the increased cost reflects a \$1.4 million correction by including the KCP contract into the statistic. Approximately 66 percent of recurring costs are attributed to fire department staffing and system inspection activities, with the remaining amount spent on engineering fees and maintenance activities. Some sites have experienced reductions in the cost of inspecting and maintaining fire protection systems by the implementation of more cost-effective policies and programs.

During the year, one fire was controlled by an automatic wet pipe sprinkler system, continuing the DOE track record on sprinkler effectiveness at a 99 percent rate.

The effectiveness of fire suppression systems was, however, offset by the inadvertent actuation of 116 systems, primarily due to freeze damage. Also, concerns remain regarding inadvertent Halon system discharges (18 of the above 116 events), which caused the release of approximately 2,684 pounds of this gaseous fire suppressant to the environment in CY 1995. This number represents an 8 percent reduction in last year's figure, however. The DOE is committed to minimizing accidental fire system discharges through design enhancements and comprehensive maintenance activities. Halon use is being reduced as part of a Department-wide policy for the phaseout of ozone depleting substances.

Future activities of the DOE fire protection community center on reducing the risk from fire to workers and the public, optimizing costs associated with fire protection, and providing support for mission advances within the Department.

DOE FIRE LOSS STATISTICS

DOE experienced no fire-related fatalities in CY 1995, continuing a trend since the inception of the AEC in 1948. Three fire-related injuries were identified at DOE due to maintenance, experimental or firefighting activities. These injuries were considered minor and unrelated, and had no common root cause. All were analyzed and appropriate remedial action taken to avoid recurrence.

Property value estimates were taken from the CAIRS database to serve as a common denominator for comparing Annual Summary loss rates to the CAIRS Summary. CAIRS data shows that DOE property values dropped approximately 4.3 percent in CY 1995.

In all, 87 fire incidents were reported consistently by field organizations, based on a comparison of their annual summaries and the CAIRS Summary. These incidents accounted for a total year-end fire loss of \$743,374. Field organizations did not report consistently the number of nonfire events, based on the same comparison, but did identify loss amounts totaling \$1,256,560.

DOE's fire loss rate for CY 1995 is approximately 0.06 cents loss per \$100 value; a decrease of about 55 percent over last year's 0.11 cent figure. This statistic is 3.5 times lower than the 1987-1993 DOE average of 0.21, continuing the downward trend in fire loss rates over the previous year. In comparison, the loss rate average for the highly protected risk (HPR) insurance industry was about 0.30 cents per \$100 value⁵. The Department's success is attributed to a conservative, yet flexible fire safety program, as well as the efforts of DOE's safety professionals in identifying and mitigating fire hazards before they result in a loss.

Table 1 characterizes Annual Summary loss histories since 1950 and includes both fire and nonfire loss rate categories. Numbers shown in parentheses represent a 5-year running average, where applicable. The accompanying figures provide a graphical representation of the Department's property valuation since 1950 (Figure 1); fire and nonfire property loss data since 1950 (Figure 2); fire loss rates over a 13 year period (Figure 3); nonfire loss rates over the same time period (Figure 4); the current year's fire loss rate for field organizations (Figure 5); and, the current year's nonfire loss rate for these sites (Figure 6). Sites that are not shown on these graphs reported either insignificant or zero losses for the year.

Analysis of fire loss data indicates that a small number of incidents constitute the majority of losses reported to the DOE. For example, the five largest fire incidents accounted for approximately 78 percent of the total loss category.

⁵Factory Mutual Research Corporation (FMRC) reports that the loss rate average is based on fire losses involving both sprinkler and nonsprinklered facilities within the HPR class of protection.

The largest fire and nonfire losses for the year are noted below:

1. OK/ETEC - A small sodium leak caused a seven week delay at the Pump Test Facility. Property losses were estimated at \$3,500; business interruption losses were estimated at \$260,400. CAIRS and ORPS report numbers were not identified.
2. OFO/FEN - Tank over-pressured and collapsed while being filled with water. Loss estimated at \$393,000.

The CY 1995 CAIRS Summary reports that 13 fire incidents caused losses totaling \$163,064; approximately \$580,000 less than field organization reports. Of this difference, \$213,000 can be traced to two brush fire incidents, \$263,500 to a single incident involving business interruption costs, and the remaining discrepancy linked to 11 other incidents which were not incorporated into the CAIRS database. The CAIRS Summary also reports 60 nonfire incidents producing losses of \$869,206, approximately \$387,000 less than field organization reports. Of this difference, \$239,000 can be traced to a number of incidents at OK where a CAIRS report was not submitted.

The Annual Summary has historically identified discrepancies between field organization annual fire protection program summaries and the CAIRS data. In many incidences, these discrepancies were traced to either delayed reporting, cost estimating differences, improper loss characterization, or a misinterpretation on the need to file a report at all. Since CAIRS loss statistics are often extracted for use in other documents such as reports to Congress, performance indicator studies, and media releases, these reported values are often less than actual loss figures. CAIRS administrators are addressing these issues by increased field training programs and by streamlining the CAIRS reporting process using state of the art electronic technology. A part of this technology includes developing a "seamless" approach using a library of definitions that allows reporting data to be related to a number of different reports.

Fire Protection Summary
For Calendar Year 1995

Table 1
DOE Loss History From 1950 To Present

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Nonfire Loss (Dollars)	LOSS RATES (cents per 100 Dollar Value)		
				Fire*	Non-Fire*	Total*
50	1,800.00	486,389	10,050	2.70	0.06	2.76
51	2,177.10	38,318	317,797	0.18	1.46	1.64
52	3,055.10	449,107	356,600	1.47	1.17	2.64
53	4,081.00	148,142	427,430	0.36	1.05	1.41
54	6,095.90	185,438	190,436	0.30	0.31	0.61
55	6,954.20	125,685	330,103	0.18 (1.00)	0.47 (0.81)	0.65 (1.81)
56	7,364.10	2,206,478	940,945	3.00 (0.50)	1.28 (0.89)	4.28 (1.39)
57	7,973.20	590,663	885,936	0.74 (1.06)	1.11 (0.86)	1.85 (1.92)
58	8,102.50	275,560	476,265	0.34 (0.92)	0.59 (0.84)	0.93 (1.76)
59	10,301.80	199,841	998,060	0.19 (0.91)	0.97 (0.75)	1.16 (1.66)
60	10,708.60	636,228	764,823	0.59 (0.89)	0.71 (0.88)	1.30 (1.77)
61	11,929.90	325,489	5,530,566	0.27 (0.97)	4.64 (0.93)	4.91 (1.90)
62	12,108.80	3,020,023	293,341	2.49 (0.43)	0.24 (1.60)	2.73 (2.03)
63	13,288.90	599,056	776,998	0.45 (0.78)	0.58 (1.43)	1.03 (2.21)
64	14,582.80	480,519	870,516	0.33 (0.80)	0.60 (1.43)	0.93 (2.23)
65	15,679.30	1,743,448	2,106,621	1.11 (0.83)	1.34 (1.35)	2.45 (2.18)
66	16,669.00	158,220	698,753	0.09 (0.93)	0.42 (1.48)	0.51 (2.41)
67	17,450.90	359,584	2,423,350	0.21 (0.89)	1.39 (0.64)	1.60 (1.53)
68	18,611.90	155,986	713,097	0.08 (0.44)	0.38 (0.87)	0.46 (1.31)
69	20,068.30	27,144,809	909,525	13.53 (0.36)	0.45 (0.83)	13.98 (1.19)
70	22,004.30	89,456	1,611,336	0.04 (3.00)	0.73 (0.80)	0.77 (3.80)
71	24,155.80	78,483	1,857,566	0.03 (2.79)	0.77 (0.67)	0.80 (3.46)
72	26,383.50	222,590	698,061	0.08 (2.78)	0.26 (0.74)	0.34 (3.52)
73	27,166.70	117,447	2,258,241	0.04 (2.75)	0.83 (0.52)	0.87 (3.27)
74	28,255.50	249,111	930,766	0.09 (2.74)	0.33 (0.61)	0.42 (3.35)
75	31,658.30	766,868	4,485,481	0.24 (0.06)	1.42 (0.58)	1.66 (0.64)
76	35,512.70	251,849	2,040,727	0.07 (0.10)	0.57 (0.72)	0.64 (0.82)
77	39,856.10	1,084,823	2,529,161	0.27 (0.10)	0.63 (0.68)	0.90 (0.78)
78	47,027.10	12,976,036	4,501,943	2.76 (0.14)	0.96 (0.76)	3.72 (0.90)
79	50,340.80	654,716	1,886,307	0.13 (0.69)	0.37 (0.78)	0.50 (1.47)
80	54,654.70	1,385,686	7,160,249	0.25 (0.69)	1.31 (0.79)	1.56 (1.48)
81	59,988.80	2,042,633	2,600,855	0.34 (0.70)	0.43 (0.77)	0.77 (1.47)
82	65,360.40	948,691	3,252,277	0.15 (0.75)	0.50 (0.74)	0.65 (1.49)
83	70,484.40	731,234	9,765,828	0.10 (0.73)	1.39 (0.71)	1.49 (1.44)
84	82,166.90	1,549,807	4,917,513	0.19 (0.19)	0.60 (0.80)	0.79 (0.99)
85	86,321.84	1,145,975	2,983,322	0.13 (0.21)	0.35 (0.85)	0.48 (1.06)
86	82,787.52	805,030	4,490,262	0.10 (0.18)	0.54 (0.65)	0.64 (0.83)
87	91,927.20	1,570,736	1,440,093	0.17 (0.13)	0.16 (0.68)	0.33 (0.81)
88	92,998.00	466,120	7,837,000	0.05 (0.14)	0.84 (0.61)	0.89 (0.75)
89	107,948.00	615,551	6,890,000	0.06 (0.13)	0.64 (0.50)	0.70 (0.63)
90	115,076.00	8,392,746	9,078,000	0.73 (0.10)	0.79 (0.51)	1.52 (0.61)
91	119,236.00	623,940	2,019,000	0.05 (0.22)	0.17 (0.59)	0.22 (0.81)
92	119,294.00	1,260,950	3,647,805	0.11 (0.21)	0.31 (0.52)	0.42 (0.73)
93	120,733.88	781,269	3,193,534	0.06 (0.20)	0.26 (0.55)	0.32 (0.75)
94	125,733.88	1,417,138	2,287,372	0.11 (0.20)	0.18 (0.43)	0.29 (0.63)
95	120,579.98	743,374	1,256,560	0.06 (0.21)	0.10 (0.34)	0.16 (0.55)

*Numbers shown in parentheses represent the 5-year running average.

Figure 1

DOE Property Valuation

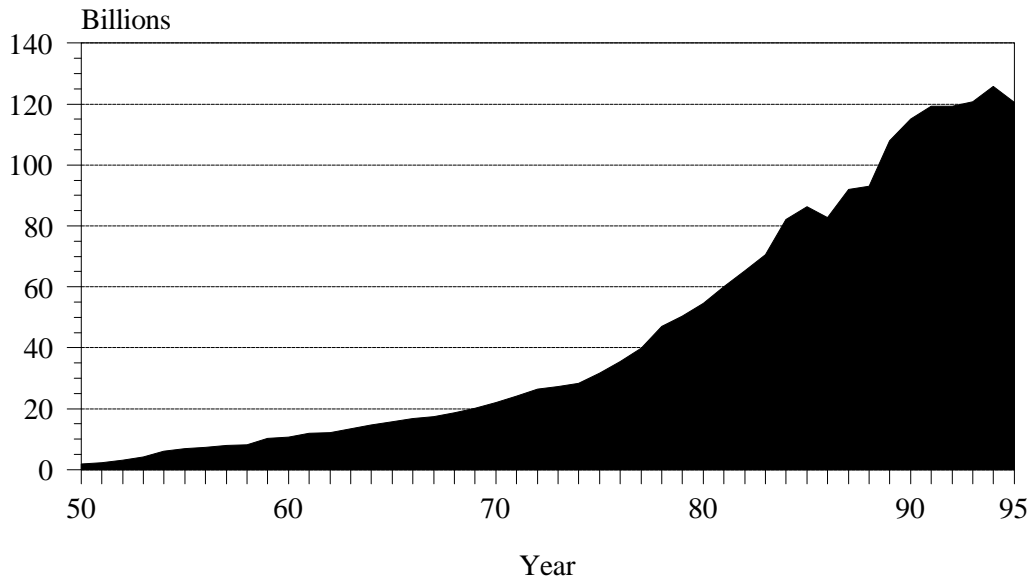


Figure 2

Property Loss

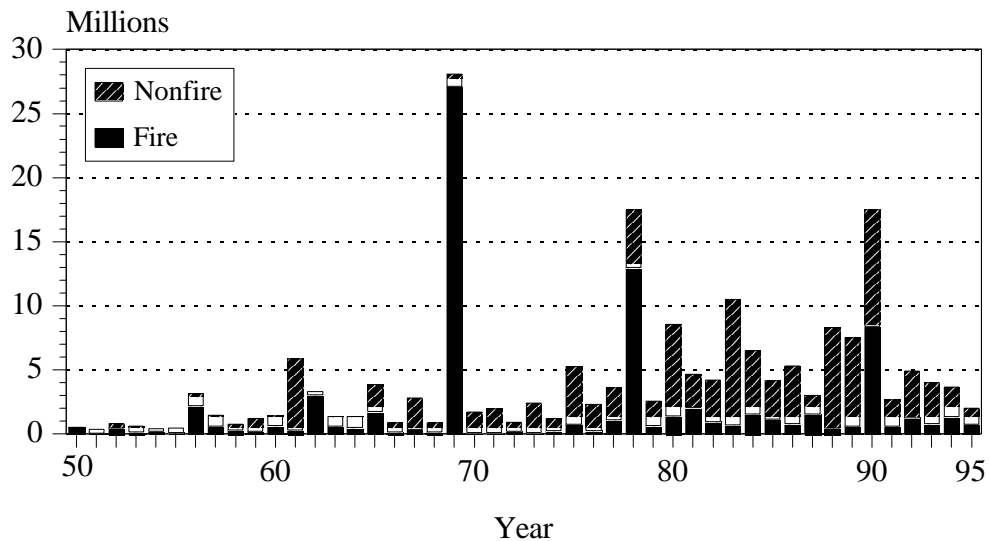


Figure 3

DOE Fire Loss Rate

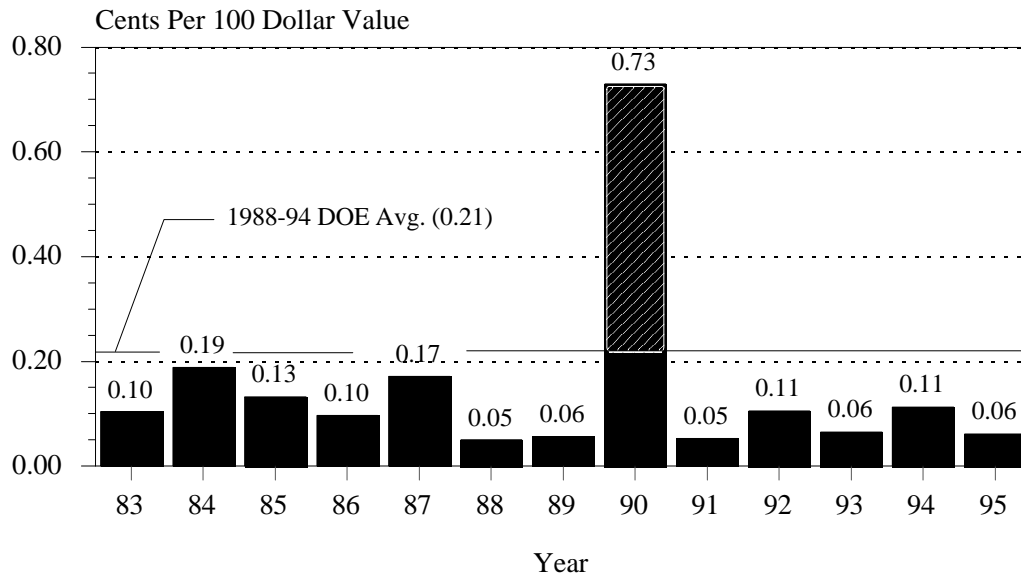


Figure 4

DOE Nonfire Loss Rate

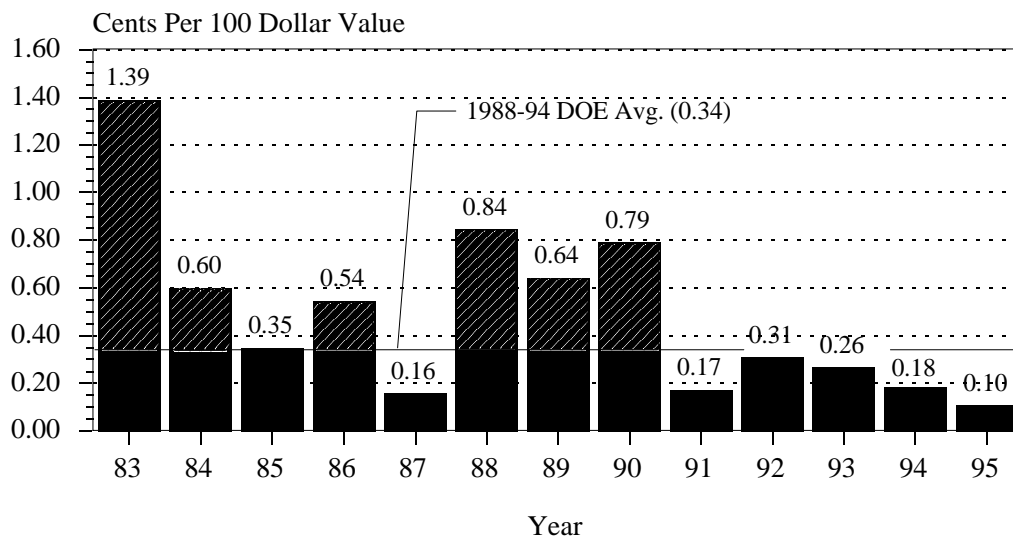


Figure 5
Fire Loss Rate by Field Organization

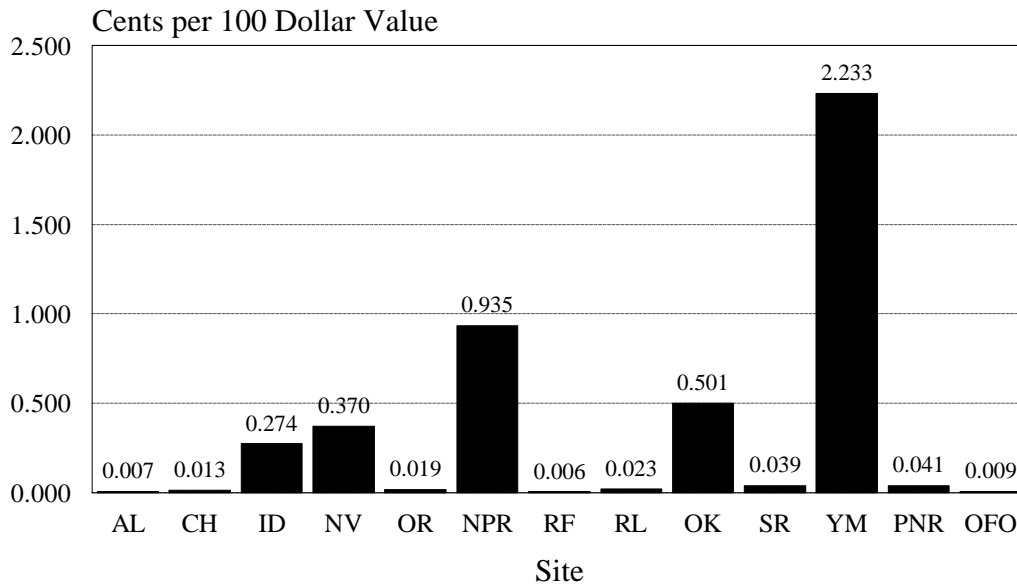
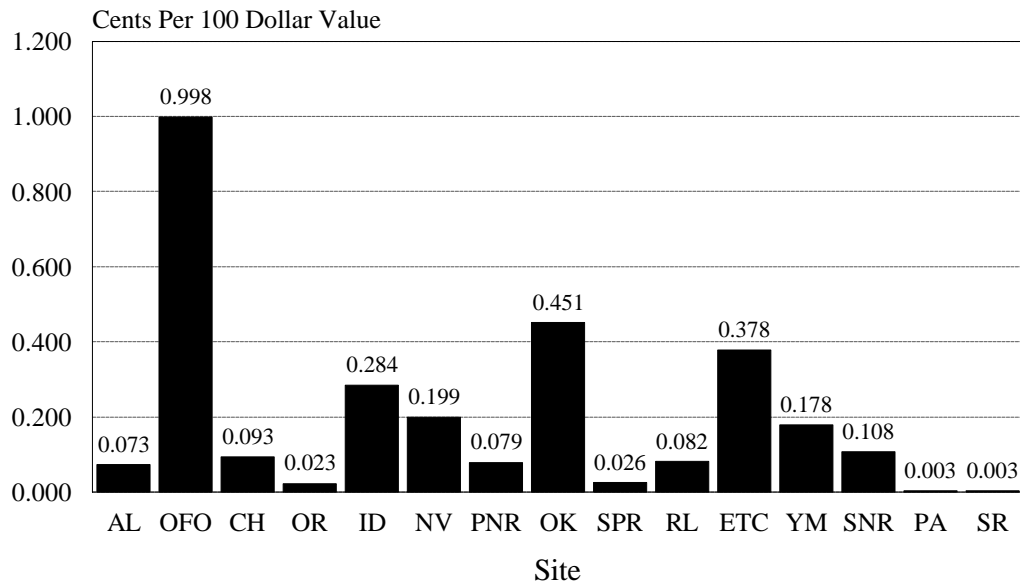


Figure 6
Nonfire Loss Rate by Field Organization



Fire Protection Summary
For Calendar Year 1995

SIGNIFICANT FIRE LOSS DATA

The following is a brief review of the five largest DOE fire losses. Other significant losses are included in Table 2.

1. OK/ETEC - A small sodium leak caused a seven week delay at the Pump Test Facility. Property losses were estimated at \$3,500; business interruption losses were estimated at \$260,400. CAIRS and ORPS report numbers were not identified.
2. NPR-1 - Brush fire burned approximately 4,800 acres. Loss estimated at \$115,000. CAIRS and ORPS report numbers were not identified.
3. ID/INEL - Range fire burned a (10 X 3/4) mile path approximately 3.5 miles southwest of ANL-W. Loss estimated at \$85,000. CAIRS and ORPS report numbers were not identified.
4. NV/NTS - Range fire burned approximately 4,500 acres near between areas 25 and 30. Loss estimated at \$71,074. CAIRS No. 164 ORPS No.95-0335.
5. SR/SRS - Transformer in Building 105-P shorted out causing the breaker to blow out and begin to smoke. Estimated Damage was set at \$45,000. CAIRS and ORPS report numbers were not identified.

**Table 2
Significant Fire Losses For CY-95**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire	AL/SNLL	Elevator hydraulic pump ran continuously, causing small fire.	\$5,839.
Fire	CH/ANLE	Worker driving a fence post struck an underground electrical line causing a short and fire in an upstream electrical box.	\$ 8,200.*
Fire	OR/Y-12	Vehicle fire in engine compartment of undetermined cause.	\$12,000.*
Fire	OR/ORNL	Fluorescent light ballast containing PCB's ignited plastic housing and lens cover.	\$8,000.*
Fire	RL	Fire in a trailer unit heater during off shift hours. Fire self extinguished. CAIRS No.:95002	\$7,670 .
Fire	RL	Vehicle fire in engine compartment. Suspected cause was a leaking fuel line. CAIRS No: 95022 .	\$9,000.
Fire	RL	Dry snack food containers were ignited in an employee kitchen. Fire source was a smoldering oven mitt.	\$2,000.*
Fire	ID/INEL	An electrical fire started on the heater element for the satellite disc at the Secure Communications Relay Station	\$10,000.*

*No CAIRS report.

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 98 incidents were reported where water-based suppression systems operated in CY 1995: 48 were wet-pipe systems, 18 dry-pipe, 29 deluge, 1 pre-action and 2 foam deluge systems. Of the wet-pipe system activations, one was directly related to fire. Other system activations were caused by the following events: acts of nature(39), human error(13), thermal(8), electrical(3), mechanical(9), miscellaneous(11), not reported(14).

Significant water-based system activations of interest are listed in Table 3.

Table 3
Significant Water Based System Actuations

LOSS TYPE	LOC.	DESCRIPTION	DOLLAR LOSS
Fire	AL/KC	Fire occurred in a process oven after the process controller failed. Fire was controlled by a single sprinkler near the oven exhaust duct. CAIRS No: 95116	\$4,530.
Nonfire Mechanical	ID\INEL	Fusible link failed on a sprinkler system at CPP-602. Similar heads in area were replaced.	\$6,000.*

* No CAIRS report.

There are now a total of 225 incidents in DOE records where sprinkler systems of all types operated in a fire. The satisfactory rate of performance is 99.1 percent, or 223 times out of 225 incidents. The two failures during a fire were attributed to: a closed cold weather valve in 1958 controlling a single sprinkler in a wood dust collector; and, a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

From the above history, DOE has experienced 97 fires that were either controlled or extinguished by the "wet-pipe" type of automatic fire suppression system. Table 4 below provides a summary on the number of sprinklers actuated to control or extinguish a fire against the number of occurrences where this event was reported. For example: 95 percent of these fires were controlled or extinguished with less than 4 sprinklers activating, 72 percent were controlled with 1 sprinkler activating, and so on.

The significance of this table is to highlight actual performance of systems that have been installed according to standard design practices. In this case, the relevant standard is National Fire Protection Association (NFPA) Standard 13, "Installation of Sprinkler Systems." By comparing the actual performance to design requirements, the designer or reviewer can get a sense of the conservative nature of the design requirement and adjust the design where necessary. The design of sprinkler system water containment systems, for example, could be based on actual performance rather than strict design practice, since no specific design criteria exist on the subject.

Table 4
**DOE Wet-Pipe Automatic Sprinkler Performance
1955 to 1995**

Number of Sprinkler heads Activated per Fire Event	Number of Events	Cumulative Total of Events	Percentage of Event	Cumulative Percentage of Events
1	69	69	72	72
2	16	85	17	89
3	4	89	4	93
4	2	91	2	95
5	2	93	2	97
6	1	94	1	98
7	2	96	2	100
8	0	96	0	100
9+	1	97	1	100

HALON FIRE SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFC's), including Halon 1211 and 1301, on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently drafted rules to include: prohibiting new Halon production; establishing container labeling requirements; imposing Federal procurement restrictions; imposing significant Halon taxes; issuing requirements for the approval of alternative agents; and listing essential areas where Halon protection is considered acceptable.

DOE's current policy does not allow the installation of any new Halon systems. Field organizations have been requested to aggressively pursue alternative fire protection configurations for existing systems and to effectively manage expanding Halon inventories as a result of downsizing. Halon inventory is being "banked" at the Savannah River Site and utilized to replenish drawdown from existing systems determined essential to DOE's mission. The long-term goal is the gradual replacement of these essential systems.

In CY 1995, the DOE had 885 Halon 1301 fire suppression systems in operation containing approximately 297,547 pounds of agent. Halon 1301 inventory was reported at approximately 114,679 pounds. Operational and inventory amounts for the Halon 1211 were reported at 170,641 and 15,849 pounds, respectively.

Field organizations reported that 36 non-essential systems have been disconnected, increasing DOE's Halon inventory by approximately 8,000 pounds.

Table 5 provides a breakdown of the five largest Halon-utilizing field organizations, listing both Halon 1301 (fixed system fire extinguishing agent) and Halon 1211 (portable fire extinguishing agent). "Agent Drawdown" quantities represent the amount of Halon that was released to the environment over the calendar year. The bulk of Halon utilized within the Power Administrations is shared between BPA (14,495 lbs. in 6 systems) and WAPA (13,319 lbs. in 29 systems).

Table 5
Significant DOE Sites Utilizing Halon Suppression Systems

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (lbs.)	INVENTORY (lbs.)		ACTIVE (lbs.)	INVENTORY (lbs.)
SR	75,000	24,630	1,627	15,574	5,573
AL	49,721	13,856	76	66,571	2,388
CH	40,751	23,880	200	19,429	70
PA	27,814	2,788	0	38,323	4,425
SPR	30,638	0	0	400	0
Total	225,225.00	66,455.00	1,903.00	141,508.00	13,667.00

A total of 18 incidents were reported where Halon 1301 fire suppression systems operated in CY 1995. No sites reported any Halon system failures during a fire. Approximately 2,684⁶ pounds of agent were discharged in these events.

⁶ The above figure does not consider system leakage in a stable condition.

Fire Protection Summary
For Calendar Year 1995

Table 6 lists all Halon 1301 system activations in CY 1995 of 100 pounds or more. The designation NA indicates that this report was not included in the CAIRS Summary and mentioned (without a dollar loss report) in the field organization's annual fire protection report.

Table 6
Halon 1301 Actuations Greater than 100 lbs.

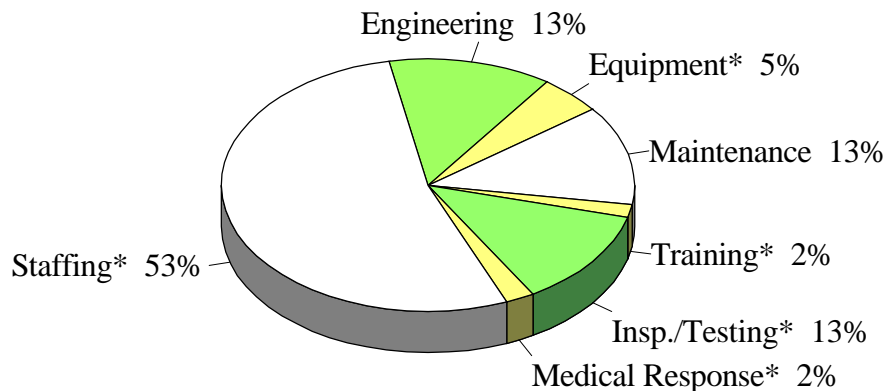
LOSS TYPE	LOCATION	DESCRIPTION	AGENT RELEASED	DOLLAR LOSS
Nonfire-Miscellaneous	SR/SRS	Fumes from towels drying in an oven circulated through the HVAC system and activated the smoke detector controlling the Halon system..	516 lbs.	NA
Nonfire-Human Error	SR/SRS	Halon system discharges during alarm system test.	420 lbs.	NA
Nonfire-Electrical	SR/SRS	Electrical malfunction discharges Halon system.	400 lbs.	NA
Nonfire-Miscellaneous	OR/Y12	Overheating A/C unit	100 lbs.	NA
Nonfire-Miscellaneous	OK/LLNL	Overheating A/C unit	100 lbs.	NA
Nonfire-Miscellaneous	CH/BNL	Halon system discharged in an unoccupied room. System was removed from service.	126 lbs.	NA
Nonfire-Act of Nature	ID/INEL	Multiple lighting strikes caused the Halon system to discharge.	200 lbs.	\$3,500.*
Nonfire-Miscellaneous	PNR/BAPL	Halon control panel malfunction caused system actuation.	510 lbs.	\$9,480.*
Nonfire-Electrical	OFO/MB	Control panel malfunction causes Halon system to actuate.	170 lbs.	NA

* No CAIRS report identified.

RECURRING FIRE PROTECTION PROGRAM COSTS

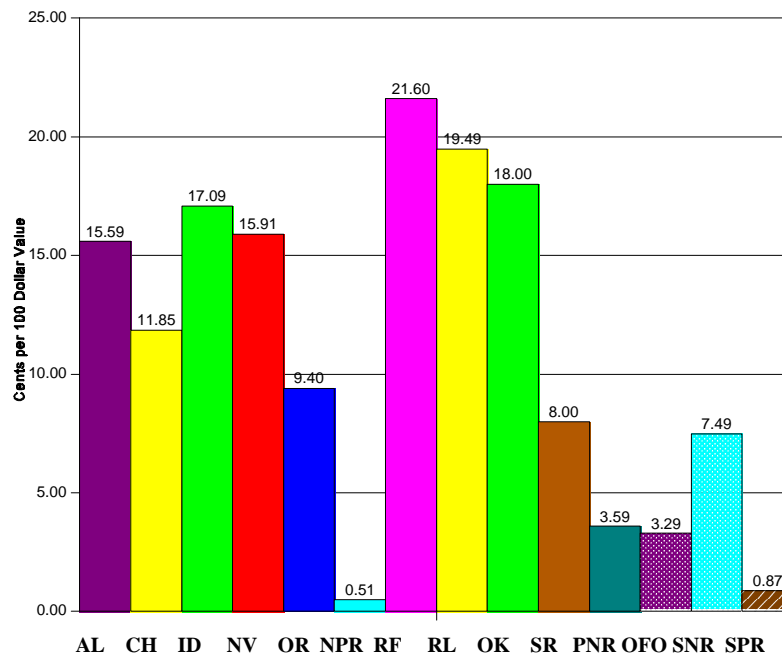
Yearly or recurring fire protection costs for CY 1995 approached \$110 million for the DOE complex. On a ratio of cost to replacement value, the DOE spent approximately 9.1 cents per \$100 replacement value for recurring fire protection activities. CY 1995's cost includes the KCP Fire Department contract amount of approximately 1.4 million dollars and excludes all major fire protection construction projects. Figure 7 provides a distribution of DOE's overall recurring fire protection costs reported in CY-95. Figure 8 lists the recurring cost rate based on the CAIRS replacement value for DOE's Field organizations. It should be noted that not all recurring fire protection costs were consistently reported from field organizations, such as outside contracts and maintenance activities; therefore, the accuracy of these data are suspect. The DOE Office of Environment, Safety, and Health is planning enhancements to its reporting system, including a computerized capability, in an effort to minimize the potential for future errors, omissions, and inconsistencies.

Figure 7
Recurring Fire Protection Cost Distribution



* Fire
Department
Activities

Figure 8
Cost Rate by Operations Office



FIRE DEPARTMENT RESPONSES

The following is a summary of fire department responses for CY 1995. These numbers represent data sent in from approximately 28 fire departments and fire brigades stationed at DOE sites.

1. Fire	586
2. Hazardous Materials	554
3. Other Emergency	2,338
4. Other Non-Emergency	4,125
5. Medical	2,523

Comparing this data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Office of Environment, Safety and Health is currently examining the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901, "Uniform Coding for Fire Protection" that could be linked to other DOE incident reporting programs for an accurate and cost effective approach to data collection at DOE. Other options, such as folding DOE's fire data collection into State or National programs such as the National Fire Incident Reporting System, are also being considered.

CONCLUSION

As indicated by the data that have been compiled and summarized in this report, the DOE Fire Protection Program continues to be successful in minimizing the risk from fire to the public as well as to Department workers, programs and property. DOE's fire safety performance indicators compare favorably with those available from private industry. If the DOE were to match its fire loss rate to that of the private sector, it would have to incur losses of over 3.6 million dollars (as opposed to actual losses totalling \$743,374) to meet comparable industry losses for CY-1995.

One, continuing, undesirable trend is reflected in the area of inadvertent automatic fire suppression system actuation. However, policies and programs are in place that are intended to minimize this trend in the future.

Inconsistencies have been revealed between the data collected for the Annual Summary and those generated in the CAIRS Summary. A likely cause of these inconsistencies is the multitude of data requests that need processing for any single event as well as lack of uniform guidance on the definition and quantification of non-fire losses. An attempt is currently underway, however, to rectify this situation by streamlining the mechanics of data collection and by defining loss terms or reporting attributes in such a way as to make it clear to those responsible what data headquarters wants to collect and analyze.